Airborne-particle Abrasion Is a Minimally Invasive Method to Pre-Treat Sclerotic, Non-Carious Cervical Dentin

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Objectives

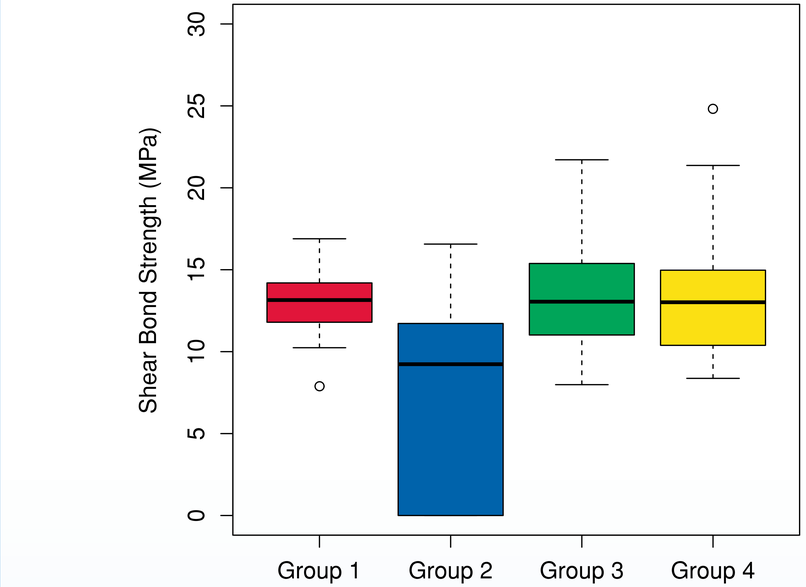
To investigate substance loss and bond strength capacity of sclerotic, non-carious cervical dentin after airborne-particle abrasion or diamond bur preparation.

Methods

Fifteen non-sclerotic dentin specimens were made from crowns of extracted human incisors of which the labial surfaces had been ground with silicon carbide papers (non-sclerotic control; Group 1). Forty-five sclerotic dentin specimens (n=15/group) were made from the labial, non-carious cervical root part of extracted human incisors and underwent either no pre-treatment (sclerotic control; Group 2), pre-treatment with airborne-particle abrasion (CoJet Prep [3M ESPE] and 50 µm aluminium oxide; Group 3), or with diamond bur preparation (40 µm grit size; Group 4). Substance loss after pre-treatment was measured in Groups 3 and 4. Subsequently, Scotchbond Universal (3M ESPE) and resin composite (CeramX [DENTSPLY DeTrey]) were applied on the treated dentin surfaces. The specimens were stored at 37°C and 100% humidity for 24 h. After storage, shear bond strength (SBS) was measured and data analyzed with nonparametric ANOVA followed by Wilcoxon rank sum tests.

Results

Substance loss (medians) was 19 µm in Group 3 and 113 µm in Group 4. SBS-values (MPa; medians) in Group 2 (9.24) were significantly lower than in Group 1 (13.15; p=0.0069), Group 3 (13.05; p=0.01), and Group 4 (13.02; p=0.0142). There were no significant differences in SBS between Groups 1, 3, and 4 (p≥0.8063).

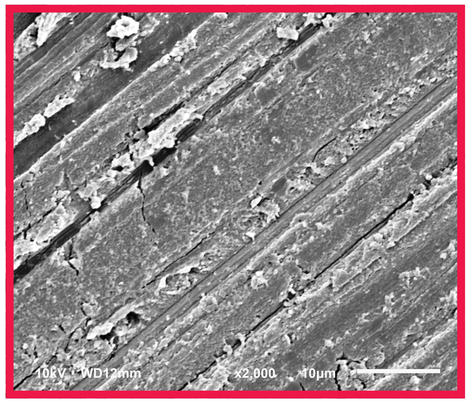


Shear bond strength (MPa) of Scotchbond Universal to non-sclerotic dentin (Group 1), sclerotic dentin (Group 2), airborne-particle abraded, sclerotic dentin (Group 3), and diamond bur prepared, sclerotic dentin (Group 4).

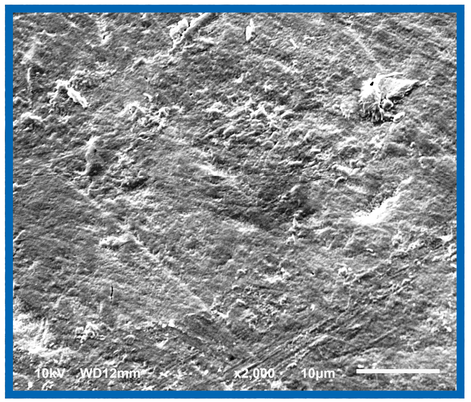
Conclusion

Airborne-particle abrasion and diamond bur preparation restored bond strength of Scotchbond Universal to sclerotic dentin to the level of non-sclerotic dentin, with airborne-particle abrasion being less invasive than diamond bur preparation.

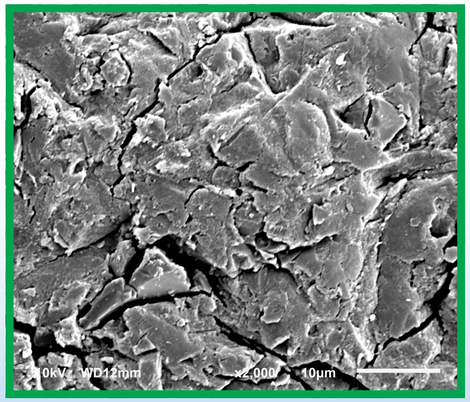
Acknowledgements: The authors would like to thank G. Fischer, Institute of Mathematical Statistics and Actuarial Science, University of Bern, for the statistical analysis. Furthermore, we thank I. Badertscher, School of Dental Medicine, University of Bern, for the preparation of this ePoster.



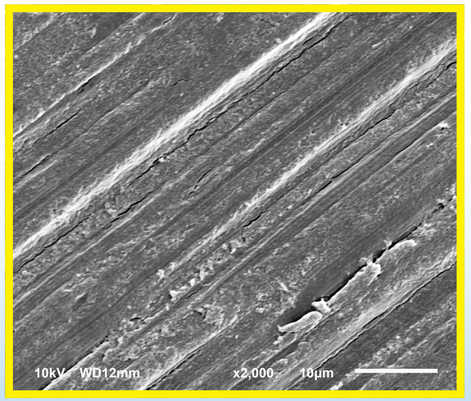
Group 1: Non-sclerotic dentin after grinding with silicon carbide paper (2000× magnification).



Group 2: Sclerotic dentin without pre-treatment (2000× magnification).



Group 3: Sclerotic dentin after pre-treatment with airborne-particle abrasion (2000× magnification).



Group 4: Sclerotic dentin after pre-treatment with diamond bur preparation (2000× magnification).